

WHAT IS CLAIMED IS

1. A nanowire comprising:  
a core portion having a carbon nanotube having at least  
5 one layer of a graphene sheet; and  
a functional layer formed around the core portion and  
having at least one layer of a modified graphene sheet.
2. The nanowire according to claim 1, wherein the  
10 modified graphene sheet has an amorphous carbon area.
3. The nanowire according to claim 1, wherein a  
structure different in structure from the graphene sheet is  
bonded with modified carbon atoms in the modified graphene  
15 sheet.
4. The nanowire according to claim 3, wherein the  
structure is a functional molecule.
- 20 5. The nanowire according to claim 1, wherein the  
functional layer has insulating properties.
6. The nanowire according to claim, wherein the  
functional layer has semiconductor properties.

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7. The nanowire according to claim 1, wherein another material is dispersed in the functional layer.

8. The nanowire according to claim 7, wherein the  
5 another material is a doping agent.

9. The nanowire according to claim 7, wherein the another material is a functional molecule.

10 10. The nanowire according to claim, wherein a predetermined material is incorporated into a hollow tubular portion of the carbon nanotube forming the core portion.

11. The nanowire according to claim, wherein the  
15 carbon nanotube forming the core portion has a structure showing semiconductor properties.

12. The nanowire according to claim, wherein the carbon nanotube forming the core portion has a structure  
20 showing conductor properties.

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13. The nanowire according to claim 1, further comprising a second functional layer provided as an outer layer than the functional layer, the second functional layer being  
25 different in structure from the functional layer.

14. A nanonetwork comprising a plurality of nanowires each having:

a core portion having a carbon nanotube having at least one layer of a graphene sheet; and

a functional layer formed around the core portion and having at least one layer of a modified graphene sheet in which a graphene sheet has been modified, wherein the functional layers adhere to one another at least in side surfaces of the nanowires so as to form a network structure.

15. A carbon structure comprising:

a multi-walled carbon nanotube having at least two layers of graphene sheets; and

an amorphous carbon area at which a graphene sheet forming an outermost layer of the carbon nanotube is partially connected with at least one graphene sheet forming an inner layer of the carbon nanotube.

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16. A method for producing a nanowire, comprising the step of:

carrying out at least a modification treatment on a multi-walled carbon nanotube having at least two layers of graphene sheets so as to produce a nanowire having a core

*B*

portion and a functional layer, the core portion having a carbon nanotube having at least one layer of the graphene sheets, the functional layer formed around the core portion and having a modified graphene sheet originated from at least one of the  
5 graphene sheets around the core portion.

17. The method according to claim 16, wherein the modification treatment is a mechanochemical treatment.

10 18. The method according to claim 17, wherein the modification treatment is a combination of the mechanochemical treatment and at least one treatment selected from a group of a heating treatment, an acidic solvent treatment, and an ultrasonic treatment.

15 19. The method according to claim 16, wherein the modification treatment is carried out till hollow tubular portions surrounded by a graphene sheet originated from the carbon nanotube of the core portion and node portions  
20 separating the hollow tubular portions are formed alternately in the nanowire in a longitudinal direction of the nanowire.

20. The method according to claim 16, wherein the modification treatment is carried out till defects are produced  
25 at least in a surface of the multi-walled carbon nanotube so

that a carbon nanotube having a hollow tubular portion surrounded by a graphene sheet is left as the core portion while the modified graphene sheet originated from at least one of graphene sheets is formed around the core portion.

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21. The method according to claim 20, wherein the modified graphene sheet has an amorphous carbon area.

22. The method according to claim 16, wherein the  
10 modification treatment is carried out till defects are produced at least in a surface of the multi-walled carbon nanotube so that a carbon nanotube having a hollow tubular portion surrounded by a graphene sheet is left as the core portion while the modified graphene sheet originated from at least one of  
15 graphene sheets and which has an amorphous carbon area is formed around the core portion, and a network structure in which a plurality of such nanowires adhere to one another through the amorphous carbon areas is formed.

20 23. The method according to claim 16,  
wherein the multi-walled carbon nanotube has at least three layers; and  
wherein the functional layer has at least two layers of modified graphene sheets.

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24. A method for producing a nanonetwork, comprising  
the steps of:

providing a nanowire A having:

a core portion having a carbon nanotube having at  
least one layer of a graphene sheet; and

5 a functional layer formed around the core portion  
and having at least a modified graphene sheet which has  
an amorphous carbon area,

providing nanowire B having:

10 a core portion having a carbon nanotube having at  
least one layer of a graphene sheet; and

a functional layer formed around the core portion  
and having at least one layer of a modified graphene sheet,  
crossing the nanowire A and one of the nanowire B and  
15 a carbon nanotube so that an amorphous carbon area in the  
nanowire A is in contact with the one of the nanowire B and  
the carbon nanotube; and

irradiating the crossing portion with an electron beam  
so as to electrically connect the nanowire A with the one of  
20 the nanowire B and the carbon nanotube.

25. An electronic device comprising a nanowire having:

a core portion having a carbon nanotube having at  
least one layer of a graphene sheet; and

25 a functional layer formed around the core portion

and having at least one layer of a modified graphene sheet,

wherein the nanowire is used as electric wiring.